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Application of Family-Centered Care in Neonatal Umbilical Cord Care: A Two-Case Description of Dry Care and Topical Breast Milk Application

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ABSTRACT

Background: Umbilical cord care is an important part of neonatal care to support umbilical cord release and prevent infection. The Family Centered Care (FCC) approach encourages family involvement in newborn care.
Objective: Describe the application of FCC in neonatal umbilical cord care using Topical Breast Milk and dry methods.
Methods: The study used a descriptive case study design on two neonates at Koja Hospital, North Jakarta, in June 2026. Data were collected through studies, interviews, education, demonstrations, return demonstrations, and observation of umbilical cord conditions. Family involvement and ability were assessed based on maternal participation in care, understanding of education, ability to practice umbilical cord care, and ability to recognize signs of infection in the umbilical cord. Data were analyzed descriptively by describing the findings in each case.
Results: In the first case with topical breast milk, the umbilical cord detached spontaneously at 3 days 8 hours 10 minutes of age, while in the second case with the dry method, the umbilical cord detached at 4 days 12 hours 5 minutes after birth. During the observation period, no signs of infection were found in both neonates. The application of FCC includes education, practice mentoring, monitoring of umbilical cord conditions, and family involvement in neonatal care.
Conclusions: The application of FCC can support family involvement in neonatal umbilical cord care through education and practice mentoring. Findings regarding umbilical cord release timing and clinical conditions in both cases are descriptive and cannot be used to prove the comparative effectiveness or safety of topical Topical Breast Milk methods and dry methods

Keywords: Family Centered Care, neonates, cord care, topical breast milk, dry method.

Introduction

The neonatal period is a time prone to a variety of health problems as the baby is adapting from intrauterine to extrauterine life. One important aspect of neonatal care is cord care to support the natural release process and prevent infection. Improper care, including suboptimal hygiene and the use of inappropriate materials, can increase the risk of contamination and infection (Gessesse et al., 2026). Therefore, cord care needs to pay attention to hygiene, monitoring the condition of the umbilical cord, and the family's ability to recognize danger signs in neonates.(Lazzerini et al., 2024). The World Health Organization (WHO) recommends clean and dry umbilical cord care as part of the essential care of newborns. (Guidelines Review Committee, 2022)

Neonatal care is not only the responsibility of health workers, but it also requires the involvement of families, especially mothers, as primary caregivers of infants after discharge from a health facility. The Family-Centered Care (FCC) approach places families as active partners in the care process through partnership, communication, information, and support according to the needs of the family (Lazzerini et al., 2024)(Hodgson et al., 2025). In neonatal care practice, the application of FCC can be carried out through education, demonstrations, return demonstrations, and mentoring so that mothers are able to carry out care independently. (Dessalegn et al., 2022) Families also need to have the ability to recognize signs of cord infection, (Aridayanto et al., 2025) such as widespread redness around the base of the umbilical cord, swelling, discharge of purulent fluid, and an unpleasant odor that requires examination by health professionals (Bajaj et al., 2025)(Lubbe et al., 2026). Thus, the success of the FCC's implementation needs to be seen from the process of family involvement, understanding, and the family's ability to care for babies.

A number of studies have discussed the importance of education and maternal skills in umbilical cord care. Umbilical cord care education is reported to increase the knowledge of postpartum mothers (Sihombing & Noviyani, n.d.)(Lestari & Herawati, 2026). The mother's knowledge and skills are also aspects that need to be considered in the implementation of cord care (Ariani, 2024). (Mariani et al., 2024) shows the relationship between the mother's knowledge and skills and the healing time of the umbilical cord in newborns. In addition to the educational aspect, the umbilical cord care method has also become a concern in research. The dry method is carried out by keeping the umbilical cord clean and dry without the provision of additional materials (Sari et al., 2022), while the topical method of breast milk uses breast milk applied to the umbilical cord (Küçük et al., 2024). Systematic review by (I. I. Hassan & Bara, 2026) demonstrates the potential topical application of breast milk in influencing umbilical cord release time, although the available evidence still warrants further study. (Harahap et al., 2022) Meanwhile, clean and dry care remains the WHO's recommendation for routine umbilical cord care. (Guidelines Review Committee, 2022)

Although previous research has addressed education, knowledge, maternal skills, and various cord care methods, descriptions of FCC implementations that integrate education, family involvement in care practices, and monitoring of cord conditions in the context of different treatment methods still need to be developed. FCC implementation also requires the support of health care providers through adequate communication and mentoring. Challenges in FCC implementation in neonatal and pediatric care rooms include communication, resources, and institutional support (Hendrawati et al., 2026)(Chen et al., 2025). Therefore, the contribution of this study is directed at providing an overview of the process of implementing FCC in two contexts of cord care, namely the topical method of Topical Breast Milk and the dry method, by taking into account the involvement of families,

the ability to perform treatment, and monitoring the condition of the cord. This study is not intended to prove the effectiveness or determine the advantages of one of the treatment methods.

Based on this description, this study aims to describe the application of Family-Centered Care in cord care in two neonates at Koja Hospital, North Jakarta, using the topical method of Topical Breast Milk and dry methods. The aspects described include the process of education and family assistance, involvement and ability of mothers in performing cord care, the condition of the umbilical cord during the observation period, signs of infection, and the time of cord release. The results of the study are expected to provide a practical overview for health workers regarding the involvement and empowerment of families in the care of the umbilical cord of neonates.

Method

This study uses a descriptive case study design with a two-case approach (multiple case study) to describe the application of Family Centered Care (FCC) in umbilical cord care in two neonates with different methods, namely topical Topical Breast Milk and dry methods. Case units include each neonate and their families, with a focus on the mother's involvement and ability in the care and development of umbilical cord conditions.

The research was conducted at Koja Hospital, North Jakarta, in June 2026. Subjects were selected purposively based on suitability with the focus of the study. Inclusion criteria include full-term neonates with stable general conditions, no signs of cord infection, no abnormalities affecting cord condition, availability of breast milk for topical care, and mothers or families willing to follow observations and provide written informed consent. Exclusion criteria include neonates with conditions that require intensive care, experiencing cord infections or systemic infections, having complications that require changes in medical management, or families unwilling to continue involvement in the research.

Data collection was carried out by researchers with room nurses from the time the neonates were hospitalized until the umbilical cord was removed. During hospital treatment, the room nurse helped observe the condition of the umbilical cord, helped educate mothers about cord care, and supported data collection. The application of FCC was carried out through education, demonstrations, return demonstrations, mentoring, and involvement of mothers in care according to the methods applied in each case. After the neonates went home, monitoring was continued by the researcher through daily home visits until the umbilical cord was removed.

Observations included maternal involvement in care, understanding of education, ability to practice cord care, and ability to recognize danger signs in neonates. Cord condition was observed based on cleanliness, drying process, redness, swelling, discharge, foul odor, and cord release time. Data were collected using observation sheets, maternal interviews, clinical documentation, photographs of cord conditions, and family diaries. Observation results were recorded based on implementation time to document the development of cord conditions and family involvement during the observation period.

The validity of the data was checked through triangulation by matching the results of direct observations, maternal interviews, photos of cord conditions, and family diaries. Source triangulation was carried out by comparing information from mothers or families, the results of the researcher's observations with the nurse's room, and the clinical documentation of the neonates. The suitability of information was examined based on the time of data collection and the development of cord conditions.

Data were analyzed descriptively through two stages. First, the analysis of each case was carried out by describing the characteristics of the newborn and the family, the process of applying FCC, maternal involvement and ability, umbilical cord condition, signs of infection, and the timing of cord release. Second, cross-case analysis was conducted by identifying similarities and differences in findings between the cases of the topical Topical Breast Milk method and the dry method. The results were presented in a narrative manner to illustrate the application of FCC in both care contexts. This analysis was not intended to test the causal relationship, prove the effectiveness, or determine the comparative advantages and safety of the two treatment methods.

The implementation of nursing care for the two neonates is part of routine nursing services at Koja Hospital, North Jakarta, and has obtained permission to implement it from the hospital. Data for the preparation of the article were obtained from nursing care documentation, observation sheets, maternal interviews, clinical documentation, and family diaries. Informed consent was obtained from each mother as a parent and guardian of the neonates, including consent to the use of data and documentation for the purpose of scientific publications. The identities of all participants were disguised to maintain confidentiality and privacy. This study did not obtain formal ethical approval from the Health Research Ethics Committee.

Population and Sampling

The population in this study was neonates who underwent cord treatment at Koja Hospital, North Jakarta, during the study period and met the criteria that had been set. Inclusion criteria included full-term neonates with stable general conditions, showing no signs of cord infection, no abnormalities affecting cord condition, availability of breast milk for topical care, and mothers or families willing to follow observation and provide written informed consent. Exclusion criteria included neonates with conditions that require intensive care, experiencing cord infections or systemic infections, having complications that require a change in medical management, or families unwilling to continue involvement in the study.

This study involved two neonates who were selected purposively (purposive sampling) based on the suitability of the subject's characteristics with the purpose of the study. The two cases were selected to obtain an in-depth description of the application of Family Centered Care (FCC) in two umbilical cord care contexts, namely the topical Topical Breast Milk method in the first case and the dry method in the second case. The two neonatates were female, spontaneously born with a body weight of 3,000 grams each and a body length of 49 cm. The first case was born at 37 weeks gestation to a mother with a history of obstetrics P1A0, while the second case was born at 39 weeks gestation from a mother with a history of obstetrics P2A1. Both neonates had a generally stable condition based on the initial assessment and no signs of umbilical cord infection were found at the beginning of observation.

The determination of two cases is based on the objectives of the descriptive case study, which is to describe in detail the process of education, demonstration, mentoring, involvement and family capabilities, as well as monitoring the condition of the umbilical cord until spontaneous release. The clinical characteristics and family context of each case are described to provide a contextual picture of the treatment process. The two cases are not intended as a comparison group to test the effectiveness of the topical Topical Breast Milk method and the dry method. Therefore, the similarities and differences in findings are presented descriptively without drawing conclusions about the advantages or causal relationships between the two treatment methods.

Instruments and Measurements

Data were collected using neonate characteristics sheets, umbilical cord condition assessment sheets, infection sign observation sheets, family involvement and skill observation sheets, educational guidelines, demonstrations, and documentation of the development of umbilical cord conditions. Data collection was carried out through direct assessments of neonates and families, observations, structured interviews, demonstrations and return demonstrations, and documentation of umbilical cord conditions.(Lubbe et al., 2026) Observations were carried out consistently using the same instrument in both cases. Data collection began with the identification and screening of potential cases based on inclusion and exclusion criteria. After meeting the criteria, parents or families were given an explanation of the objectives, procedures, benefits, risks, and rights during the research process followed by signing informed consent as proof of consent.

Data Collection and Analysis

Aspects observed in neonates include the characteristics, initial condition of the umbilical cord, changes in the condition and color of the umbilical cord, the drying process, signs of infection (redness, edema, bleeding, fluid, and odor), as well as the date and time of cord release. (Bajaj et al., 2025) In the aspect of Family Centered Care, observations include family understanding of procedures through education, the ability to wash hands correctly with soap and running water before and after treatment, the ability to perform cord care, the ability to keep the umbilical cord clean and dry, the ability to recognize signs of infection by the demonstration and return demonstration methods, involvement in monitoring the condition of the umbilical cord, confidence, and the ability to perform care independently with the observation method. (Lestari & Herawati, 2026) Furthermore, self-monitoring, the family is directed to observe the condition of the umbilical cord at home, record the changes found, and report the condition to the researcher during the observation period by means of documentation and communication with the researcher.

In the case of topical Topical Breast Milk, mothers are given education and demonstration of cord care procedures using breast milk. Education includes the importance of washing hands with soap and running water before and after treatment, maintaining hand hygiene during the milking process and breast milk application, and preventing breast milk contamination. Breast milk is expressed hygienically using cleaned hands, then thinly applied to the surface and base of the umbilical cord using clean hands. After application, the umbilical cord is left open without being covered with gauze or other materials to dry naturally. Topical breast milk application procedure refers to the literature (Alemu et al., 2019), while hygiene principles are applied during the treatment process. Application is carried out once a day during the observation period and continued until the umbilical cord is removed.

After being given a demonstration, the mother was asked to perform treatment independently through the return demonstration method to assess their understanding and skills in carrying out the procedure. The mother and family were also educated not to give other additives to the umbilical cord and to be able to recognize signs of infection, such as redness around the base of the umbilical cord, swelling, discharge of fluid or pus, and unpleasant odor. During hospital treatment, education and observation of umbilical cord condition were supported by the room nurse. After the neonates went home, the researcher conducted daily home visits to observe the condition of the umbilical cord, monitor the implementation of treatment by the mother, and document the development until the

umbilical cord was released. Observations were made using observation sheets and documentation of umbilical cord conditions. The procedure is the implementation of topical Topical Breast Milk treatment which refers to the literature and hygiene principles of umbilical cord care.

In the case of dry cord treatment, it is done on the principle of keeping the cord clean and dry without the application of additional materials (Sari et al., 2022). Families are given education on how to wash their hands properly using soap and running water before and after treatment, keep the umbilical cord dry and get air circulation, keep diapers not covering the umbilical cord. Families are not allowed to provide other additives and families are given education about the signs of infection that need to be looked out for in the neonates umbilical cord.

Data were analyzed descriptively in each case. Data on neonate characteristics, umbilical cord condition, signs of infection, drying process, and umbilical cord release time were presented in the form of tables and narratives. Data on the implementation of Family-Centered Care (FCC) were analyzed descriptively based on indicators of family involvement and ability in umbilical cord care. The observed indicators included: (1) family involvement, namely the participation of mothers or family members in the umbilical cord education and care process; (2) understanding of treatment procedures, namely the ability to re-explain the stages of care that had been given; (3) the ability to perform treatment, namely the ability to re-demonstrate the umbilical cord treatment procedure according to the applied method; (4) understanding of the signs of infection, namely the ability to mention the signs of infection in the umbilical cord; and (5) confidence and independence, which was described through the readiness and involvement of the mother in carrying out care without direct assistance during the implementation at home.

The assessment of the family's ability is carried out through observation, interviews, and return demonstrations. The family is categorized as capable of carrying out care if they can demonstrate the stages of treatment according to the education provided correctly. Independence is described when the mother carries out the treatment directly without the help of the researcher or nurse, although she can still receive monitoring and direction. Confidence is recorded based on the mother's statement about her readiness or confidence in carrying out treatment, if the information is available in the results of interviews or documentation. Education, demonstration, and mentoring activities are recorded as part of the FCC implementation process, while family involvement and ability are recorded as findings from observations and interviews. The results of each indicator in each case are presented based on the available documentation. Comparisons of initial and final conditions are only made if there are records at both observation times. If initial or final data are not available, indicators are presented descriptively without concluding that there is an increase in family ability, confidence, or independence.

Furthermore, both cases were analyzed descriptively to illustrate the similarities and differences in the characteristics of the neonatal and familial ones, the process of implementing FCC, family involvement, the ability to perform care, and the development of cord conditions until they were released. Cross-case analysis was used to describe the variation in findings in the two cases, not to assess the effectiveness or determine the superiority of one of the cord treatment methods.

Results

Subject 1 in this case study is Mrs. C.'s baby. Data were obtained through direct studies of neonates and families, observations, structured interviews, and examination of umbilical cord conditions. The baby was born spontaneously vaginally at Koja Hospital, North Jakarta on June 19, 2026 at 22.10 WIB, at 37 weeks gestation, with maternal obstetric status P1A0. The baby is female, birth weight is 3,000 grams, and body length is 49 cm. The general condition of the baby is good and no clinical conditions that require special care are found.

The initial assessment was carried out on June 20, 2026 at 08.00 WIB, when the neonates were 9 hours 50 minutes after birth. The umbilical cord appeared wet, yellowish-white, and clean. No signs of infection were found in the form of redness, edema, pus, or an unpleasant odor. The next observation was carried out on June 21, 2026 at 08.00 WIB, when the neonates were 1 day old 9 hours 50 minutes after birth. The umbilical cord began to appear less moist, yellowish-brown, and began to have a denser texture. No redness, edema, pus, or an unpleasant odor were found.

On June 22, 2026 at 08.00 WIB, when the neonates were 2 days old 9 hours 50 minutes after birth, the umbilical cord appeared drier, brownish to blackish, wrinkled, and harder in texture. The base of the umbilical cord appeared to shrink without redness or abnormal fluid. On June 23, 2026 at 06.20 WIB, when the neonates were 3 days old 8 hours 10 minutes after birth, the umbilical cord had dried, blackish-brown, and hardened, then detached spontaneously. The base of the umbilical cord appeared to shrink and no redness or abnormal fluid was found. Based on the observation results, the umbilical cord in the case with the topical method of breast milk was spontaneously detached at the age of 3 days 8 hours 10 minutes after birth. The complete observation results are presented in Table 1.

Table 1. Development of Umbilical Cord Condition in Subject 1 with Breast Milk Topical Treatment

Date and time	Physical condition of the umbilical cord	Conditions around the umbilical cord	Signs of infection and complications
20 June 2026 08.00 WIB	The umbilical cord is wet, yellowish-white, and looks clean.	The skin around the base of the umbilical cord looks clean, there is no redness or swelling	No redness, edema, pus, or unpleasant odor were found
June 21, 2026 08.00 WIB	The umbilical cord begins to appear less damp, brownish-yellow in color, and the texture begins to be denser	The skin around the base of the umbilical cord looks clean, there is no redness or swelling	No redness, edema, pus, or unpleasant odor were found
June 22, 2026 08.00 WIB	The umbilical cord appears drier, brownish to blackish in color, wrinkled, and has a harder texture.	The base of the umbilical cord seems to be shrinking.	No redness or abnormal fluid appears.
June 23, 2026, at 06.20 WIB	The umbilical cord appears dry, blackish-brown, and hardens, then detaches spontaneously.	The base of the umbilical cord seems to be shrinking.	No redness or abnormal fluid appears.

The implementation of Family Centered Care on Mrs. C was carried out for four days, from June 20 to 23, 2026, by involving the mother and family in the umbilical cord care process using the topical breast milk method. In the initial assessment, it was found that the

baby was Mrs. C's first child so the mother did not have experience in caring for neonatals independently. This condition is the basis for providing education and assistance to improve the mother's knowledge, skills, confidence, and independence in performing umbilical cord care. (Siva et al., 2025)

On the first day, the researcher was assisted by a nurse in the room to provide education on the goals, principles, and stages of cord care with the topical method of breast milk. Education included hand hygiene, preparation before treatment, how to express breast milk to place it in the place that has been provided for the treatment of the umbilical cord, how to carry out treatment according to the established procedures, maintain the cleanliness of the area around the umbilical cord, and recognize signs of infection. The researcher then conducted a demonstration and gave Mrs. C the opportunity to repeat the stages of treatment through the return demonstration method. At this stage, the mother's initial ability was assessed based on the accuracy of following the procedure and the need for the researcher's assistance or direction.

On the second day, the assistance was focused on the active involvement of the mother in carrying out umbilical cord care that had begun to be carried out at home. The researcher observed the mother's ability to wash her hands using soap and running water before and after treatment, follow the treatment stages with the topical method of breast milk, and keep the umbilical cord clean and dry according to the procedure. Family involvement was also observed through the provision of support to the mother, assistance as needed, and participation in monitoring the condition of the umbilical cord. Changes in the condition of the umbilical cord, including color, humidity, cleanliness, redness, swelling, fluid, bleeding, and unpleasant odor, were recorded during the monitoring process.

On the third day, the assistance was directed at strengthening the mother's skills and ability to recognize changes in the condition of the umbilical cord. The researcher gave the mother the opportunity to re-demonstrate and explain the signs of infection, such as redness that extends to the skin around the navel, swelling, pus discharge, and unpleasant odor. The mother's understanding was assessed through the answers during the interview and her ability to identify danger signs based on the explanations given. In addition, the researcher observed the mother's confidence when performing the treatment, including the courage to initiate action, the accuracy of following the procedure, and the need for assistance during implementation.

At the age of 3 days 8 hours and 10 minutes, on June 23, 2026, the baby's umbilical cord was reported by the family to be spontaneously detached at 06.20 WIB. The final evaluation of the implementation of Family Centered Care was carried out by reviewing the involvement of mothers and families, the ability to carry out cord care with topical Topical Breast Milk methods, understanding of the signs of infection, and the mother's readiness to continue caring for the baby independently. The results of the evaluation of the mother's ability were described based on observation documentation, interviews, and return demonstrations. The level of mother's independence at the end of the assistance was determined based on her ability to carry out the stages of care without direct assistance, if this was recorded in the observation results.

Overall, the implementation of Family Centered Care in Mrs. C focuses on partnerships between researchers, mothers, and families through education, demonstrations, mentoring, two-way communication, and skill evaluation. This approach provides opportunities for mothers to be actively involved in the care of their babies, raise questions and concerns, and obtain family support as needed. The development of mothers' knowledge, skills, confidence,

and independence is further described based on observational findings and interviews at each stage of mentoring. The results of the development of Family Centered Care in cord care with the topical method of Topical Breast Milk are presented in Table 2.

Table 2. Development of Family Involvement in Family Centered Care

FCC Aspects	Day 1 (June 20, 2026)	Day 2 (June 21, 2026)	Day 3 (June 22, 2026)	Day 4 (June 23, 2026)	Actual observation results
Mother's education and understanding .	Mothers are given education on umbilical cord care with topical breast milk, hand hygiene, topical breast milk procedures, and signs of infection.	Mother was asked to explain the stages of treatment that had been taught.	The mother was asked to explain the treatment procedure and the signs of cord infection.	Mother's health was evaluated through interviews	The mother did not have experience caring for the newborn independently in the initial assessment. The result of understanding after education: the mother was able to explain again about how to care for the umbilical cord with topical breast milk, how to maintain hand hygiene, how to perform the umbilical cord treatment procedure with topical breast milk, and signs of infection in the umbilical cord.
Maternal and family involvement	Mothers observe demonstrations and families provide support during education.	The mother conducts practice with the assistance of researchers and family assistance as needed.	The mother is actively involved in the treatment, while the family provides support.	Maternal and family involvement is evaluated for subsequent treatment preparation.	During the umbilical cord treatment process from days 1 to 4, the family always accompanies and helps the mother, and the mother also does not hesitate to ask for help if she feels difficult
Ability to perform topical breast milk treatments	Mother observes the demonstration of the stages of treatment according to the research procedure	The mother practiced the stages of treatment with the guidance of the researcher.	The mother did a re-demonstration to assess the accuracy of the procedure.	The final capability is reviewed based on the practical documentation.	On day 1, the mother did the handwashing stage, there was still forget, the researcher helped remind. When performing the treatment of the mother's umbilical cord after being demonstrated by the researcher directly can be without help
Monitoring of cord condition .	The initial condition of the umbilical cord was studied and the mother was introduced to	The mother observed the color, humidity, and cleanliness of the umbilical cord with the researcher.	The mother is involved in monitoring the condition of the umbilical cord and	The umbilical cord was reported to have been spontaneously detached at 06.20 WIB	Initial condition: the umbilical cord appears wet with a yellowish-white color; no sign of infection. On the fourth day, the umbilical cord was reported by the family that the umbilical

	how to observe physical changes.		reporting changes.		cord had detached spontaneously.
Understanding the signs of infection .	The mother gets an explanation about the signs of a cord infection.	Mother was asked to rename the danger signs that had been described.	Mother's ability to recognize danger signs is evaluated through questions and answers	Final understanding is evaluated based on the mother's answer.	Mother is able to rename the signs of infection on the umbilical cord
Confidence and independence .	Mothers are given the opportunity to ask questions and express concerns related to baby care	Mothers carry out care with assistance and can ask for help when experiencing difficulties.	Mothers are given the opportunity to carry out treatment with assistance as needed.	The mother's readiness to carry out care independently was evaluated.	The mother's confidence and independence during the mentoring process can be seen from the enthusiasm to learn, the worry of not being able to take care of herself to be independent without the help and support of her family and researchers which makes the mother more confident

The second subject in this case study was Mrs. S. Baby. Data were obtained through direct assessment of neonates and families, observations, structured interviews, and examination of umbilical cord condition. The baby was born spontaneously at Koja Hospital, North Jakarta, on June 19, 2026 at 20.05 WIB, at 39 weeks of gestation. The baby had a birth weight of 3,000 grams and a body length of 49 cm. The results of the study showed that the baby's general condition was good and no clinical conditions were found that required special care during the observation period.

The initial assessment was carried out on June 20, 2026 at 07.00 WIB, when the neonates were 10 hours 55 minutes old after birth. The umbilical cord still looked wet, yellowish-white, and in a clean condition. In the area around the umbilical cord, no signs of infection were found in the form of redness, edema, purulent secretions, or bad odors. Treatment was carried out by the dry method, which is to keep the umbilical cord clean and dry without the provision of topical ingredients. On June 21, 2026 at 07.00 WIB, when the neonates were 1 day old 10 hours 55 minutes after birth, the umbilical cord began to appear drier, especially at the base. The condition of the umbilical cord remained clean and no signs of infection were found in the surrounding area. Furthermore, on June 22, 2026 at 07.00 WIB, when the neonates are 2 days old 10 hours and 55 minutes after birth, the color of the umbilical cord changes to yellowish-brown, accompanied by increased dryness and hardening of the tissues. The base of the umbilical cord also begins to appear smaller, without being accompanied by redness, edema, purulent secretions, or an unpleasant odor.

On June 23, 2026 at 07.00 WIB, when the neonates were 3 days old 10 hours 55 minutes after birth, most of the umbilical cord tissue appeared dry, hardened, and blackish-brown. The skin area around the base of the umbilical cord remained unobserved. The change in color and consistency describes the process of drying the umbilical cord prior to spontaneous release. On June 24, 2026 at 08.10 WIB, when the neonates were 4 days old 12

hours 5 minutes after birth, the umbilical cord detached spontaneously. Before release, the base of the umbilical cord appeared to shrink and no redness or abnormal fluid was found in the surrounding area. During the observation period, there were no signs of infection in the form of redness that spread to the skin around the navel, edema, purulent secretions, or an unpleasant odor. The general condition of the baby remained good.

Overall, the observation results showed a gradual change in the condition of the umbilical cord, starting from wet, then drying, changing color to yellowish-brown to blackish-brown, and experiencing tissue hardening and shrinkage of the base before spontaneously detaching at the age of 4 days 12 hours 5 minutes after birth. During the observation period, no signs of infection were found based on the observations. The full results of the observations are presented in Table 3

Table 3. Development of Umbilical Cord Conditions in Subject 2 by Dry Method

Date and time	Color and physical condition of the umbilical cord	Condition of the base of the umbilical cord	Signs of infection	Observation results
20 June 2026 07.00 WIB	The umbilical cord appears wet, yellowish-white, and clean.	Still wet and moist.	No redness, edema, purulent secretions, and unpleasant odor were found.	The umbilical cord is still in a wet condition and has not shown any drying.
June 21, 2026 07.00 WIB	The umbilical cord begins to appear drier, especially the base.	It starts to dry.	No redness, edema, purulent secretions, and unpleasant odor were found.	The process of drying the umbilical cord begins to be seen without signs of infection
June 22, 2026 07.00 WIB	The umbilical cord is yellowish-brown, getting drier, and starting to harden.	It seems to be shrinking.	No redness, edema, purulent secretions, and unpleasant odor were found.	Discoloration, increased dryness, tissue hardening and shrinkage of the umbilical cord base
June 23, 2026 07.00 WIB	Most of the umbilical cord appears dry and blackish-brown in color.	Blackened and dry appearance	No redness, edema, purulent secretions, and unpleasant odor were found.	The umbilical cord dries out and darkens in color ahead of spontaneous release.
June 24, 2026 08.10 AM local time	The umbilical cord appears blackish dry and then detaches spontaneously.	The base of the umbilical cord seems to be shrinking	No redness, edema, purulent secretions, and unpleasant odor were found.	The umbilical cord detached spontaneously at 08.10 WIB.

At the beginning of the study, Mrs. S said that she did not understand how to do umbilical cord care and did not have experience caring for babies independently. This is related to the experience of losing her first child at the age of two days after birth. Currently, daily baby care is still largely assisted by Mrs. S's parents. (Almalki et al., 2025b) The implementation of Family Centered Care is carried out by placing the mother as a partner in the treatment process through two-way communication, providing information, demonstrations, mentoring, and direct involvement in cord care using the dry method.

The assistance began with an assessment of Mrs. S's understanding, experience, and difficulties in caring for the baby. The researcher was assisted by the room nurse in providing education about the goals, principles, and procedures of cord care with the dry method. Educational materials included the importance of hand hygiene, the steps to wash hands

using soap and running water before and after treatment, how to perform cord care according to the procedure, efforts to keep the umbilical cord clean and dry, and the recognition of signs of infection, such as redness that extends to the skin around the navel, swelling, purulent secretions, and unpleasant odor. The mother was also given the opportunity to ask questions, express concerns, and express difficulties that may be faced during treatment at home.

After providing education, the researcher conducted a demonstration on the steps to care for the umbilical cord using the dry method. Furthermore, Mrs. S was asked to conduct a return demonstration with assistance to assess the understanding and skills that had been acquired. The assessment was carried out through direct observation of the mother's ability to wash her hands using soap and running water, perform the stages of cord care according to the procedure, keep the umbilical cord clean and dry, and recognize signs of infection that require the attention of health workers. During the practice, the researcher provided direction and feedback according to the mother's needs to strengthen the understanding and accuracy of the action.

During the observation period, Mrs. S was actively involved in monitoring the condition of the baby's umbilical cord on a daily basis. Monitoring included changes in color, dryness, tissue consistency, umbilical cord base condition, and possible signs of infection. The mother was given the opportunity to present the results of her observations and discuss the actions that needed to be taken if abnormal changes were found. In addition to technical skills, the researcher also observed the mother's response and confidence when performing the treatment, including her willingness to ask questions, follow directions, and repeat the steps of the action if necessary. This involvement is a form of partnership in Family Centered Care because the mother actively participates in the process of caring for and monitoring the baby's condition.

At the end of the mentoring period, the evaluation was carried out through direct observation of the implementation of umbilical cord care and the mother's ability to re-explain the principles of care and signs of infection. The aspects evaluated included understanding of the procedure, the accuracy of washing hands before and after treatment, the ability to perform umbilical cord care, the skill of keeping the umbilical cord clean and dry, the ability to recognize signs of infection, involvement in monitoring, confidence, and independence in carrying out treatment. Based on the results of the evaluation, Mrs. S was able to perform all stages of treatment correctly without direct assistance. The findings showed that the mother was able to perform cord care independently at the end of the mentoring period. The application of Family Centered Care in this case supports the active involvement of the family, increased understanding, and the development of maternal skills in neonatal care, so that it is hoped that care can be continued appropriately at home. The results of the development of Family Centered Care in the treatment of the umbilical cord with the dry method are presented in Table 4.

Table 4. Development of Family Involvement in Family Centered Care

Date	FCC Aspects	Assessment activities and methods	Maternal development
20 June 2026	Needs assessment and initial understanding	Interviews about experiences, understanding, and difficulties caring for babies.	Mothers do not understand the procedure for caring for the umbilical cord and are not experienced in caring for the baby independently.

June 21, 2026	Education and understanding of procedures	Education and demonstrations on washing hands with soap and running water, dry cord care, keeping the umbilical cord clean and dry, and recognizing signs of infection.	The mother obtained information and examples of correct umbilical cord care steps. Understanding was evaluated through questions and answers.
June 22, 2026	Grooming skills	Return demonstration and direct observation of hand hygiene and umbilical cord maintenance stages.	Mothers were able to do hand hygiene and umbilical cord care with Return demonstration, the researcher provided feedback as needed
June 23, 2026	Participation, monitoring, and confidence	Observations of maternal involvement in monitoring color, dryness, umbilical cord base condition, and signs of infection; interviews were supplemented.	The mother was involved in monitoring the condition of the umbilical cord. Her response and confidence were assessed based on the results of observation.
June 24, 2026	Evaluation of ability and independence	Direct observation and return demonstration to assess the accuracy of procedures, hand hygiene, understanding of signs of infection, and maternal independence	The umbilical cord was spontaneously detached at 08.10 WIB. The mother's ability to perform treatment independently was recorded based on the results of the final evaluation.

Discussion

Umbilical cord care is one of the important aspects of newborn care that aims to support the process of drying and releasing the umbilical cord and prevent infection. In this case study, the application of Family Centered Care was carried out in two neonates with different umbilical cord care methods, namely the topical method of Topical Breast Milk in Case 1 and the dry method in Case 2. The results showed that the umbilical cord in Case 1 was detached at the age of 3 days 8 hours 10 minutes, while in Case 2 it was detached at the age of 4 days 12 hours 5 minutes. Thus, there was a difference in the time of release for one day between the two cases. (Harahap et al., 2022) During the observation period, no signs of cord infection were found recorded in both neonates. These findings describe the process of cord removal in two different treatment methods by involving families in the treatment process and monitoring of cord conditions. However, these results cannot be used to conclude the superiority or effectiveness of either method.

In Case 1, the application of the topical method of breast milk showed that the umbilical cord was detached at the age of 3 days 8 hours 10 minutes. These findings are descriptively in line with the research (I. I. Hassan & Bara, 2026) that topical breast milk can shorten the release time of the umbilical cord. This is in line with previous studies that reported significant differences in release time between the topical groups of breast milk and the dry method. (Harahap et al., 2022) The difference in release time reported in previous studies showed that there was a variation in results in the application of the topical method of breast milk. The results of the previous study showed that breast milk contains biological components, including immunoglobulins and lactoferrin, which have antimicrobial activity.

However, the presence of these components does not directly prove that the topical use of breast milk causes faster cord release in this case. Therefore, the results in Case 1 are more accurately interpreted as an illustration of the timing of cord release during the application of the topical method of Topical Breast Milk with family assistance, rather than as evidence of a cause-and-effect relationship (Chamidah & Maharani, 2023).

In Case 2, cord care is carried out using the dry method, which is to keep the cord clean and dry without the provision of additional materials (Sari et al., 2022). Dry cord treatment is one of the recommended approaches for routine neonatal care because it emphasizes cleanliness, contamination prevention, and maintenance of the condition of the cord to keep it dry.(Guidelines Review Committee, 2022) recommends clean, dry cord care, while (Bajaj et al., 2025) emphasized that the dry method is still suitable for applications with a low incidence of omphalitis. Prevention of infection needs to be accompanied by hand hygiene before and after touching the baby, avoiding giving non-recommended materials to the umbilical cord, and conducting periodic monitoring. Monitoring of the condition of the umbilical cord is carried out by observing the presence of redness that extends to the surrounding skin, swelling, purulent secretions, and unpleasant odors. (M. A. Hassan et al., 2026) The general condition of the neonatals was good from the beginning of the assessment until the umbilical cord was released. In the case of the application of the observed dry method, no signs of umbilical cord infection were recorded during the monitoring period on a daily basis. The observation results showed that the process of drying and releasing the umbilical cord took place gradually during the observation period. These findings can be compared with the study (Sari et al., 2022) Regarding the application of the dry method. The application of the dry method needs to be accompanied by hand hygiene practices, efforts to keep the umbilical cord clean and dry, and periodic monitoring of the condition of the umbilical cord.

The difference in umbilical cord release time in the two cases, namely the age of 3 days 8 hours 10 minutes in the topical Topical Breast Milk method and the age of 4 days 12 hours 5 minutes in the dry method, needs to be understood as a variation in the results observed in two different neonates.(Harahap et al., 2022) The difference cannot be interpreted as evidence that the topical method of Topical Breast Milk is more effective than the dry method. (Küçük et al., 2024) The limited number of subjects did not allow for statistical assessment of differences, whereas the individual characteristics of the neonates, the initial condition of the umbilical cord, and the consistency of treatment implementation potentially affected the observed outcomes. Both methods were also applied to different subjects so that the influence of treatment methods could not be separated from the variation of individual conditions. In addition, no signs of infection were found (I. I. Hassan & Bara, 2026) recorded during observation. In both cases, it is not enough to prove that both methods have an equivalent level of safety or infection prevention ability. Thus, the results of this study are more appropriately seen as a description of the application of two umbilical cord treatment methods in the context of family assistance.

In addition to observing the process of cord drying and release, this study applies Family Centered Care as an approach that actively involves mothers and families in neonatal cord care.(Lazzerini et al., 2024) In the initial assessment, the mother in Case 1 said that she did not understand how to take care of the umbilical cord and had no experience in caring for

the baby independently because the baby was her first child. (Almalki et al., 2025b) Baby care is initially still largely assisted by the mother's parents. Meanwhile, in Case 2, the mother had the experience of losing her first baby at the age of two days. Although it was the birth of the second child, the experience did not necessarily indicate that the mother had the skills to perform cord care independently. (Almalki et al., 2025a) Baby care is currently still largely assisted by parents. Therefore, education and assistance are provided by considering the experience, needs, and involvement of the family in neonatal care. The Family Centered Care approach places the family as partners in the care process through two-way communication, easy-to-understand information, and parental involvement in decision-making and implementation of infant care (Yeomans et al., 2026). In this study, the implementation of Family Centered Care is directed to support maternal involvement through education on cord care procedures according to the methods applied, demonstrations, return demonstrations, and monitoring of cord conditions. (Almalki et al., 2025b) Family involvement is expected to help mothers improve their understanding and skills of neonatal care, (Dessalegn et al., 2022) Although these changes need to be assessed based on the results of a documented evaluation.

The implementation of Family Centered Care in both cases was carried out through education on hand hygiene, cord care procedures according to the method used, how to keep the umbilical cord clean and dry, and the recognition of signs of infection that need to be watched out. Education continued with demonstrations and return demonstrations so that mothers had the opportunity to practice the care steps that had been taught. (Lestari & Herawati, 2026) In Case 1, cord care is carried out using the topical method of breast milk, while in Case 2 the dry method is used. Observation of the mother's practice is used to identify the stages that have been done correctly and the parts that still need explanation or correction. Through this process, the mother is directly involved in the care of the baby, not just receiving verbal explanations. Parental involvement through education, mentoring, and opportunities to participate in care is part of the implementation of Family Centered Care in neonatal services (Yeomans et al., 2026). The mother's ability to perform care needs to be assessed based on the results of practical observation, including the accuracy of the sequence of actions, hand hygiene, and the ability to recognize danger signs on the umbilical cord.(Mariani et al., 2024)

The mother's involvement in the implementation of Family Centered Care was also directed at monitoring changes in the condition of the umbilical cord during the observation period. The mother was given education about changes in color, dryness, tissue consistency, and the condition of the base of the umbilical cord, as well as signs of infection that need to be watched out for, such as redness of the skin around the umbilical cord, swelling, discharge of fluid or pus, and unpleasant odor. (Mcnair et al., 2022) The monitoring is part of the family's involvement in neonatal care, as parents need to have the knowledge to observe the baby's condition and recognize danger signs, especially after returning home from a health care facility. (Aridayanto et al., 2025) Education and parental involvement are important components of Family Centered Care interventions in neonatal services (Yeomans et al., 2026). In addition, recommendations (*WHO Recommendations for Care of the Preterm or Low-Birth-Weight Infant*, n.d.) emphasizing the importance of quality postnatal care and providing information to mothers and families to support the health of the mother and baby.

If signs are found that lead to infection or abnormalities in the umbilical cord, the family needs to immediately contact a health professional for appropriate examination and treatment.

The aspect of two-way communication is also an important part of the implementation of Family Centered Care. (Chen et al., 2025) Mothers are given the opportunity to convey questions, concerns, and experiences during the treatment process. This communication allows health workers to provide explanations and feedback according to the mother's needs and level of understanding. Parental involvement through communication, education, and active participation is an important component in the implementation of Family Centered Care in neonatal services (Yeomans et al., 2026). This approach is expected to help families understand treatment procedures and recognize conditions that require the assistance of health workers. In this study, maternal confidence, understanding, and independence need to be interpreted based on the results of documented studies and observations. Evaluation of the implementation of Family Centered Care can be carried out by observing the involvement of mothers and families in care practices, the application of hand hygiene, the accuracy of the stages of cord care, and the mother's understanding of the signs of infection.

Practically, the findings of this case study show the importance of integrating education and family assistance in neonatal umbilical cord care.(Mcnair et al., 2022) Health workers need to ensure that mothers not only receive information verbally, but also get the opportunity to practice treatment procedures through demonstrations and return demonstrations. Education needs to include hand hygiene, how to keep the umbilical cord clean and dry according to the methods applied, monitoring changes in umbilical cord conditions, and recognizing danger signs that require examination of health workers. Evaluation of the mother's understanding and skills is also needed before the family continues treatment at home. (Togo et al., 2025) This implication emphasizes the importance of family readiness in carrying out safe care, without considering that family involvement in itself guarantees the acceleration of cord release or prevents the entire occurrence of infection.

The study had several limitations. First, the number of subjects was only two neonates, each receiving a different umbilical cord treatment method, so the results could not be generalized or used to compare the effectiveness of the two methods statistically. Second, differences in individual characteristics of neonates and the initial condition of the umbilical cord could potentially affect the drying process as well as the timing of cord release. Third, the observation results only described conditions during the observation period and could not ensure the overall risk of infection. Fourth, the assessment of the implementation of Family Centered Care, including maternal understanding, skills, confidence, and independence, depended on aspects found in the field. Therefore, findings regarding family capabilities need to be interpreted according to the available evidence and not expanded beyond the results of the study.

Further research is suggested to involve a larger number of neonates with standardized subject criteria and observation procedures in order to more adequately describe variations in cord release time. In addition, subsequent studies can evaluate the implementation of Family Centered Care using more structured indicators, such as maternal knowledge before and after education, the appropriateness of care steps based on checklists, the ability to recognize danger signs, and the level of independence observed. Thus, the

contribution of Family Centered Care in supporting family readiness to care for neonates can be studied more systematically, separate from the assessment of the effectiveness of cord care methods.

Conclusion

This case study shows that the application of Family Centered Care through education, demonstrations, return demonstrations, and family mentoring supports maternal involvement in neonatal cord care. The umbilical cord with the topical method of breast milk was detached at the age of 3 days 8 hours 10 minutes, while the dry method was at the age of 4 days 12 hours 5 minutes, with no signs of infection found during the observation period. These differences have not been able to prove the superiority of one of the methods because the study only involved two neonates with different treatment methods. Therefore, health workers are recommended to implement Family Centered Care through education and mentoring according to the needs of the family, evaluate the mother's skills before continuing care at home, and ensure that the family is able to recognize danger signs in the umbilical cord. Further research is suggested to involve more subjects and use standardized Family Centered Care evaluation indicators to obtain more comprehensive results.

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Author's Contributions

All authors contributed to the preparation of this article, including the preparation of the concept and design of the case study, data collection, analysis and interpretation of the results, literature search, manuscript preparation, and revision of the article. All authors have read and approved the final manuscript for publication.

Conflict of Interest

The author states that there is no conflict of interest, both financial or non-financial, in the implementation of the case study, preparation, or publication of this article.

Ethical Agreements

The implementation of nursing care for the two neonates is part of routine nursing services at Koja Hospital, North Jakarta, and has obtained permission to implement it from the hospital. Data for the preparation of the article were obtained from nursing care documentation, observation sheets, maternal interviews, clinical documentation, and family diaries. Informed consent was obtained from each mother as a parent and guardian of the neonates, including consent to the use of data and documentation for the purpose of scientific publications. The identities of all participants were disguised to maintain

confidentiality and privacy. This study did not obtain formal ethical approval from the Health Research Ethics Committee.

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